

Glendon BioFilters

Interim

Recommended Standards For Performance, Application, and Operation & Maintenance

Interim Recommended Standards: Please note that this refers to the on-going development of this document, with future versions to include additional guidance information. It does not mean that the approved status of Glendon BioFilters is tentative nor is Glendon BioFilter Technologies awaiting further approvals for the use of their products.

The standards presented here, representing the standard-of-practice for Glendon® BioFilters in Washington State, have been developed and approved by the Washington State Department of Health. Local health officers may apply these standards in this standard-of-practice context, or upon adoption of the standards in local rule, apply them with the voice of law. To facilitate such incorporation in local rules, the standards are presented in customary rule format, with terms that both denote a "degree of importance" of various design elements and "requirement", depending on whether or not the standards are integrated into local regulatory documents. These words are:

Term	Recommended Standards: Degree of Importance	Rules: Requirements
may	optional; but consider this approach	discretionary, permissive, or allowed
should	optional; but good & accepted practice as presented, a wise & prudent choice	advised
must	not optional; good or accepted practice mandates use as presented	mandatory



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1. **Introduction** Glendon® BioFilter Technologies and their affiliates currently market, design, construct, install, and service two models of residential wastewater treatment units. Both units are based upon the same patented principles, which involve the biological treatment of wastewater (septic tank effluent) as it flows, under gravitational and matrix forces through sequential layers of mineral filter media within an in-ground containment vessel. No separate drainfield is required as final treatment and effluent disposal is contiguous with the in-ground portion by design and placement of polishing filter media over the native soil at the perimeter of the containment vessel.

Glendon® BioFilter models share the same wastewater treatment concepts, incorporating pre-treatment (septic tank), dosed distribution (pump chamber, controls & mechanics), biological treatment (BioFilter), and treated wastewater disposal (perimeter absorption area). Many of these components exist with other treatment systems. Glendon® BioFilters are uniquely characterized by the shape, size, volume and setting of its containment vessel or basin, the treatment media inside, and the dispersal / disposal medium surrounding the unit.

1.1 **Models / Capacities—**

- 1.1.1 Glendon® BioFilter Model M3 is relatively large, entirely site-constructed, with design flow capacities from 240 GPD to 480 GPD.
 - 1.1.2 Glendon® BioFilter Model M31 is generally smaller, and exhibits a different geometry and basin volume-to-GPD ratio, than the Model M3. Model M31 has design flow capacities from 90 GPD to 528 GPD: units may be partially off-site constructed, or entirely site-constructed.
 - 1.1.3 Multiple units, in the same or a variety of sizes, may be used in parallel to accomplish daily design flows to 1500 GPD.
- 1.2 **Performance Standards—** Glendon® BioFilter Models M3 and M31 have been demonstrated to meet all of the parameters of Treatment Standard 1 and Treatment Standard 2, in the treatment of residential wastewater. Disinfection of treatment unit effluent is not required. Performance with high-strength wastewater has not been proven.
 - 1.3 **Listing—** The Department of Health lists Glendon® BioFilter Models M3 and M31 on the List of Approved Systems and Products.

2 **Application Standards—**

- 2.1 **Listed Products—** Only wastewater treatment and disposal products listed on the DOH List of Approved Systems and Products may be permitted by local health officers for systems within their jurisdiction (WAC 246-272-04001, §(2)). Only the specific models listed are approved; others in manufacturers' product-lines are not approved for use in Washington State. If in doubt, check with DOH for current listing information.
- ## 2.2 **Permitting—**
- 2.2.1 Installation, and if required, operational, permits must be obtained from the appropriate local health officer prior to installation and use.
 - 2.2.2 Any application of Glendon® BioFilters outside of the conditions, allowances, or criteria described in subsection 2.0 **Application Standards** may require a waiver of local health jurisdiction rules.
 - 2.2.3 Any application of Glendon® BioFilters outside of the conditions, allowances, or criteria described in subsection 3.0 **Design Standards** constitutes an *experimental system* and must be approved by DOH (WAC 246-272-05001).

2.3 **Influent Characteristic**— Models M3 and M31 were tested and approved for the treatment of residential wastewater. Therefore Glendon® BioFilters may be used for any influent that is typical of residential wastewater

2.4 **Site Requirements**—For new construction where the installation and use of a Glendon® BioFilter is proposed, sites must exhibit the following conditions:

2.4.1 Soil Types 1A, 1B, 2A, 2B, 3-6 as classified in WAC 246-272-11001.

2.4.2 A minimum of 12 inches of soil. This 12 inches of soil must be reflected in the site-specific design and maintained by installation, and be free from the following conditions:

- ☐ The maximum seasonal high groundwater level;
- ☐ A layer of creviced or porous bedrock; or
- ☐ A strata of impermeable soil or bedrock (including very slowly permeable soil).

2.4.3 Maximum ground surface slope of 20%.

2.4.4 Sufficient suitable area for initial and replacement area to meet (from the edges of the basal area of the Glendon® BioFilter) horizontal setbacks as specified in WAC 246-272-09501. The following exception to the setback from downslope property or easement lines may be used:

<u>Depth of Soil</u>	12"	24"	36"
<u>Setback</u>	30'	15'	5'

2.5 **Extreme Cold Weather Climates Excluded**—Application of Glendon® BioFilter Models M3 and M31 is limited to areas with climates exhibiting an annual accumulation of 6000 degree heating days or less. Glendon® BioFilter Technologies must furnish local health jurisdictions the reference material needed to determine these areas in Washington State.

3 **Design Standards**—

3.1 **Pre-treatment**— External pre-treatment for solids separation and settling must be provided by a conventional two-compartment septic tank, sized according to state (WAC 246-272-11501§(2)(d)(A) and local rules.

3.2 **Daily Design Flow**—Design flow calculations / specifications must be consistent with state (WAC 246-272-11501§(1)(c)(I) and local rules.

3.3 **Treatment System Capacity**—Site-specific treatment system capacity may be met with any combination of Glendon® BioFilter models and sizes. Units of various size (GPD capacity) may be combined in parallel flow to meet daily design flow up to 1500 GPD.

3.3.1 Model M3: 240—480 GPD per individual unit.

3.3.2 Model M31: 90—528 GPD per individual unit.

3.4 **Wastewater Flow Patterns**—Wastewater flows from a conventional 2-compartment septic tank, through a pump chamber / surge tank, to one or more Glendon® BioFilters. Wastewater must be distributed to all units throughout each site-specific system in a parallel pattern such that each unit receives a proportional share, based on the GPD capacity of each unit. Pumping cycles / timing must be set to assure that the design capacity of each unit is not exceeded in any 24 hour period. (The specifics of the pump cycles / patterns have been identified by Glendon® BioFilter Technologies as subject to statutory trade secret protection.)

3.5 **Containment Vessel and Absorption Area**— Various design element requirements are presented in Table 1.

3.6 **Containment Vessel Construction Specifications**—Various design element requirements are presented in Table 2.

- 3.7 **Protected Design Elements / Design Certification**—The design elements addressed in these standards represent most, but not all, of the critical design elements of the two Glendon® BioFilter models. The information presented here is provided with the permission of Glendon® BioFilter Technologies
- 3.7.1 Glendon® BioFilters are patented and protected by federal and state statutes regarding trade secrets. As part of the department’s review and approval process, all of the critical design elements have been revealed to DOH by Glendon® BioFilter Technologies. Several of these elements have been identified by Glendon® BioFilter Technologies as trade secrets, and thus DOH is prohibited from releasing, without permission from Glendon® BioFilter Technologies, certain design-related specifics.
- 3.7.2 Design Specifics Not Available to The Public Domain / Trade Secrets— The specifics of the following design considerations have been identified as trade secrets and are subject to statutory protection: the filter media, its material descriptions and its arrangement, the influent dosing pattern or schedule, and the relationship of unit depth-of-bury to perimeter absorption area. The specifics of these design considerations are the sole property of Glendon® BioFilter Technologies.
- 3.7.3 Design Certification—So that local health officers and purchasers of Glendon® BioFilters are assured that the individual units designed and installed meet all of the design elements of the products tested, reviewed and approved by DOH, Glendon® BioFilter Technologies are required to provide written Design Certification and Installation Certification.
- 3.8 **Plan Review and Approval**—All aspects of the design of Glendon® BioFilters, except those specific design elements protected by trade secret statutes, are subject to local health officer review and approval.
- 3.9 **Site Preparation / Protection During Construction**—Both models (M3 & M31) of Glendon® BioFilters rely on the soil surface adjoining the perimeter of the containment vessel to accept and distribute the treated effluent. To assure that the site is properly prepared prior to, and protected during, construction, the standards for site preparation and protection as presented in the DOH Guidelines For Mound Systems, must be followed. (Note: this referenced document is under revision. An excerpt of the draft is included with this document as Attachment A.)
- 3.10 **Inspection**—All aspects of the installation of Glendon® BioFilters, except those specific design elements protected by trade secret statutes, are subject to local health officer inspection and approval.
- 4 **Operation and Maintenance**—
- 4.1 The system owner is responsible to assure that routine operation and maintenance servicing of the Glendon® BioFilter is provided in compliance with the manufacturers recommendations, but in no case less frequently than two times per year.

Table 1. Containment Vessel and Absorption Area

Design Element	Glendon® BioFilter Models	
	M3	M31
Basin (containment vessel)		
Volume w/o media	6.0 cu. ft. per GPD capacity of individual unit.	2.2 cu. ft. per GPD capacity of individual unit.
Shape ^{1,2}	Depth: 10-10.5 feet Width: 15-20 feet Length: 15-40 feet	Depth: 5-5.5 feet Width: 4-6 feet Length: 4-60 feet
Perimeter rim length	1 foot per each 4 GPD capacity of individual unit	
Perimeter rim grade	Level, ± ½ inch	
Materials	Impervious liner of 30 mil PVC (or equivalent), or pre-cast concrete tank, site-inspected to assure water-tightness. All lumber used in the containment vessel frame must be pressure treated.	
Effluent-to-Soil Absorption		
Maximum Hydraulic Loading Rates	Soil Types 1A, 1B, 2A, 2B, 3, 4, 5: Up to twice that specified for septic tank effluent, as per WAC 246-272, Table V. Soil Type 6: Equal to that required for septic tank effluent, as per WAC 246-272, Table V.	
Application Area & Location	Ground Slope: ≤5%: Entire perimeter may be used for sizing adjacent absorption area. >5% ≤ 20%: Only downslope side, and ½ of endslope sides may be used for sizing adjacent absorption area. Absorption area begins where the edge of the basin intersects the native grade and extends to the outer edge of the BioFilter cover sand.	
Replacement Area	The replacement area may be: 1) an entirely separate, reserved location providing adequate area and soil conditions for a complete system replacement or 2) reserved area surrounding each unit (if site is less than 5% slope) or downslope from each unit (if site is more than 5% slope), for placement of additional sand media basal area covering.	
¹ Basin configurations outside the above parameters should be the subject to agreement with the Washington State Department of Health.		
² The specific shape of a Glendon® BioFilter is governed by the design flow capacity (see subsection 3.3), and the volume and perimeter rim length criteria noted in this table.		

Table 2. Containment Vessel Construction Specifications

Design Element	Glendon® BioFilter Models	
	M3	M31
Containment Vessel (basin) ¹		
Shape established by:	Excavation	Excavation or manufactured tank
Basin sides:	Sloped, ≥50%	Vertical, may be sloped, ≥50%
Basin bottom:	"V" shaped, or flat	Flat
Perimeter rim	Grade established by posts and boards, liner supported by earthen berm under rim, liner placed over board and berm.	Grade established by post, board, and sheet-goods frame (also supplies basic shape to geomembrane-lined basin. Manufactured tank may also be used: rim established by top perimeter edge.
Backfill requirements:	NA	For geomembrane-lined basins, the internal filter media, and backfill medium sand material must be placed in alternating pattern to equalize pressures on the frame and membrane. A similar approach may be necessary for manufactured containers, depending upon the materials used in manufacture.
Liner:	Required only for in-ground construction with lumber and geomembrane: 30 mil PVC. Must be protected from puncture and abrasion during construction.	
¹ Basin construction standards for Model M31 must meet or exceed the "Containment Vessel Standards" described in the Guidelines For Sand Filters .		

Attachment A.

Site preparation for Glendon® BioFilter.

Cut trees to ground level, remove excess vegetation by mowing. Rake cut vegetation if it is, or will become, matted. Prepare the site with the following goals in mind.

- a. To break up the vegetative mat so there is no continuous restriction to the vertical flow of water, to slow the lateral movement of water at the sand-soil interface, and to stabilize the sand at the sand-soil interface.
- b. To avoid smearing the soil
- c. To avoid breaking up the structure of the soil
- d. To remove excessive vegetation so that it does not form a biomat at the sand / soil interface as it degrades.
- e. To disturb the soil no deeper than necessary. Depth is determined by the thickness of the vegetation and should be no greater than 8 inches. The goal is to loosen the matted layer.

Soil Preparation Process — A spring-loaded agricultural chisel plow is the implement of choice because it is less likely to smear the soil. An implement attached to a backhoe bucket that reaches in is preferred to driving over the basal area. Cutting the soil with backhoe teeth is not acceptable, but chisel plows described above can be mounted on the leading edge of the bucket using a bar on the outside with the teeth attached to the bar. Hand spading the surface is also an acceptable alternative and may be the preferred method on some sites. Rototilling is not an acceptable substitute and must not be used.

Soil Moisture Content -- The important point is that a rough, unsmeared surface should be left, especially in fine textured soils. Careful observation is required to assure that the soil moisture content is not too high so that the soil surface is not smeared by the action of the soil preparation process. Preparation should not proceed while the soil moisture content is too high. The finer textured soils should not be too dry, either, as the preparation process will pulverized it, destroying the structure.

Immediate construction after soil preparation is desirable. Avoid rutting and compaction of the prepared area by traffic. If it rains after the soil preparation is completed, wait until the soil dries out before continuing construction.